cannot be attributed to increase of Pressure; since the examples of *Cornuspira*, *Biloculina*, and *Cristellaria* found at depths exceeding 500 fathoms, were *far larger* than any that are known to exist in the shallower waters of the colder temperate zone. But as these all occurred in the *warm area*, whose bottom-temperature indicates a movement of water from the Equatorial towards the Polar region, it is probable that their size is related to the *temperature* of their habitat, which is found to be in like relation to the general character of the Fauna of which they formed part. On the other hand, as we now know that the climate of the deepest parts of the ocean-bottom, even in Equatorial regions, has often (if not universally) Arctic coldness, the dwarfing of the abyssal *Foraminifera* of those regions is fully accounted for on the same principle.

Besides these examples of new or remarkable forms of *Foraminifera*, the 'Lightning' dredgings yielded some peculiar bodies, the examination of which would seem to throw light upon the obscure question of the mode of Reproduction in this group. One set of these are cysts, of various shapes and sizes, composed of sand-grains loosely aggregated, as in the tests of *Lituola* and *Astrorhiza*; which, when broken open, are found to be filled with aggregations of minute yellow spherules, not enclosed in any distinct envelope. These are supposed by the Author to be *reproductive gemmules* formed by the segmentation of the sarcodic body of a Rhizopod, in the same manner as 'zoospores' are formed in Protophytes by the segmentation of their endochrome. Of such segmentation he formerly described indications in the sarcodic body of *Orbitolites*; and corresponding phenomena have been witnessed by Prof. Max Schulze. But in another set of cysts, of similar materials but of firmer structure, bodies are found having all the characters of *ova*, with *embryos* in various stages of development. In none of these, however, does the embryo present characters sufficiently distinctive to enable its nature to be determined; and the hypothesis of the Foraminiferal origin of these bodies chiefly rests upon the conformity in the structure of the wall of the cysts with that of the tests of *Lituola* and *Astrorhiza*, and upon the improbability that such cysts should have been constructed by animals of any higher type.

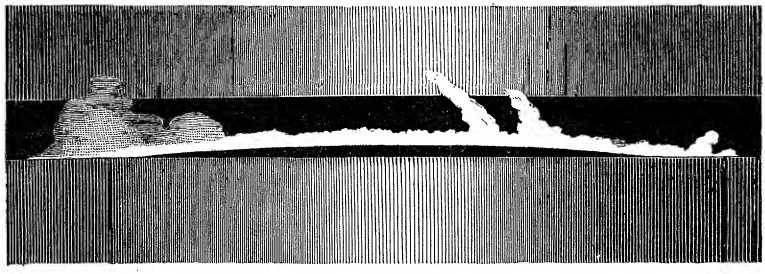
"Spectroscopic Observations of the Solar Prominences, being Extracts from a Letter addressed to Sir J. F.W. Herschel, Bart., F.R.S., by Captain Herschel, R.E., dated 'Bangalore, June 12th and 15th, 1869*.'" Communicated by Sir J. Herschel. Received July 19, 1869.

I have too little time to devote to lengthy descriptions, and so I send you a *sketch* of what I saw this morning (fig. 1). I have seen many such views during the last month, but none so distinct in outline as to-day—more by

* Received since the end of the Session.

token I have been waiting many days for sunshine since I brought my apparatus to its present state. I can only devote a single morning hour to it (before breakfast), but I make a little advance every day. The dark band across is a slit-image corresponding to C (aperture about 1′). Through the slit, as through a screen, is seen the *monochromatic* image of the "chro-

Fig. 1.



mosphere," a continuous envelope, which may be seen of nearly the same width everywhere. I estimate it at 20″ to 30″. Through the slit comes also a segment of the true limb, whose light is scattered up and down. It is wanting in C-light, and therefore within the C-image of the slit is seen a *dark* segment of the sun's limb, an inversion which nothing but "luminology" can enable one to understand. There are two classes of solar cloud* represented here; viz. the fleecy and the well defined: in both cases I have taken the liberty of seeing round the corner (so to speak), and giving the whole form as it might be seen by slightly pressing on the tube. With this exception, and a like one due to my having (to avoid confusion) retained a slightly stronger definition in *the central* parts than one actually obtains when so much of the limb is seen, there is, I believe, no exaggeration†. The whole picture, of course, is to be supposed seen on a background of pretty strong solar spectrum; and the vertical streaky light is to be supposed just short of dazzling—as strong, in fact, as the eye can bear without losing its power of distinguishing relative intensities.

A large group of spots (of which more anon) was visible just within the limb yesterday, but was not traceable to-day; it must have gone off near those horns.

The universality of the hydrogen envelope, now beyond dispute, would account satisfactorily for the dark C and F lines in solar light; and one might well rest content there; but the δ (bright) line is as persistent in this envelope as α and β (C and F); yet there is no *trace* of any absorption-line, corresponding to δ, in the solar light. The discrepancy between fact

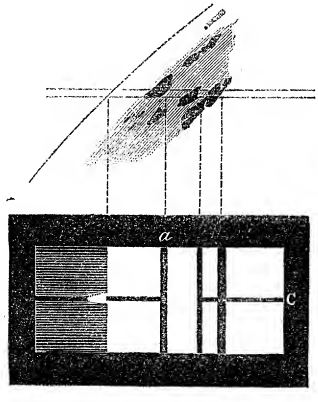
* The word has been objected to as inappropriate; but so long as we may speak of "clouds of smoke," "clouds of dust," "clouded vision," &c., it is crippling language to object on the score of inaccuracy.

† [The original sketch was in pencil, and the contrast between light and shade is exaggerated in the woodcut.—G. G. S.]

and theory covers something radical. What that may be remains to be *dis*covered. [The position of δ is 1015·3 (K) ± ·8.]

On the 10th I remarked (and observed till perfectly certain) that the C-line *on the disk* varied sensibly in strength; and at one place, which, I believe, corresponded to the penumbra of a spot-group, near the limb there was a *total* absence of the line, and a strong suspicion of a reversal (fig. 2). Faculæ were noticed round about, especially between the group and limb; but there was nothing of the kind visible where the hiatus in the C-line seemed to indicate. The hiatus extended, as did also the suspected *bright* part *within* the spot-sp. (*a*).

Fig. 2.



The observation was repeated on the 11th (yesterday) with the same result, except that the *bright* part of the line was not noticed. To-day (the 12th) the spot was round the corner. On no other spot examined was anything so decided seen, but the suppression of the dark line has been more than suspected elsewhere.

Lastly, I detected to-day, and put beyond doubt, that the bright accumulations on the disk (which I believe are the so-called "faculæ") give a continuous spectrum! I first noticed that every now and then there were bright streaks up and down the spectrum as the slit passed over the disk (or *vice versâ*). It is no easy thing in general to identify *certainly* the exact source of light whose spectrum you see; but in one case I had a spot near the limb, and one of these luminous streaks between the two; so, knowing the *direction* of the slit, it *was* easy, on removing the spectroscope, to determine precisely from what point of the disk the light in question emanated. In this case it was clear that it proceeded from a facula in that region.

I do not pretend to speculate on the constitution of the sun's surface, but here are three facts which require explanation:—

(1) A luminous line in the envelope corresponds with no visible line of absorption in the solar spectrum.

(2) The absorption is absent in an (apparently) penumbral region,

(3) The facula spectrum is an intensified solar spectrum.

June 15th. A Number of 'Scientific Opinion' has just been lent me, in which I see a notice of a paper, "A fourth communication by Mr. N. Lockyer" to the Royal Society. It tells me (what I might have expected) that I am just two months behind in all that I am seeing. However that may be, the

sights themselves are so beautiful and interesting that no other incentive is needed. This morning I showed —— a magnificent prominence upwards of 3′ in height; and she testifies that my sketches do not do them justice.

The instrument I am now using is the Royal Society's spectroscope as fitted up for the eclipse; but I have increased the dispersion nearly threefold by inserting four compound prisms (extracted from the hand-spectroscopes). These amount to 7 inches of glass and sixteen surfaces; so you may imagine that there is some loss of light and definition. I have also had to shorten the focal distance (and therefore diminish the magnifying-power) by interposing a hand-telescope's object-glass—an additional obstruction and complication. I lost a great deal of fine weather (of which I get very little now) while trying to perfect this arrangement. I can still further increase the dispersion (without much loss of definition for *monochromatic light*) by turning the main prism, and so departing from the position of minimum deviation. But this is a resource which I keep to go on with when I tire of the advantage I have gained already.

The long train of compound prisms (as at present arranged) unfortunately bars me from the violet end of the spectrum. This is unfortunate, as it would be in the highest degree interesting to compare the α and γ images. Some day I shall get impatient, pull the whole affair to pieces, and arrange afresh with this object. As it is, I have to be very chary of quitting beaten ground, as we boast of no instrument-makers here!

I wish I had time to write fully and connectedly on the subject. It is only necessary to put people on the track. It is one easily followed, and will amply repay any expenditure in arranging prisms to get a maximum dispersion, for there is any amount of light.

XXVII. "Some Experiments with the Great Induction Coil at the Royal Polytechnic." By John Henry Pepper, F.C.S., Assoc. Inst. C.E. Communicated by J. P. Gassiot, Esq. Received June 12, 1869.

The length of the coil from end to end is 9 feet 10 inches, and the diameter 2 feet; the whole is cased in ebonite; it stands on two strong pillars covered with ebonite, the feet of the pillars being 22 inches in diameter. The ebonite tubes &c. are the largest ever constructed at Silvertown Works.

The total weight of the great coil is 15 cwt., that of the ebonite alone being 477 pounds.

I am indebted to Mr. Apps for the following details. The primary wire is made of copper of the highest conductivity, and weighs 145 lbs.; the diameter of this wire is ·0925 of an inch, and the length 3770 yards. The number of revolutions of the primary wire round the core of soft iron is 6000, its arrangement being 3, 6, and 12 strands.

Fig. 1.

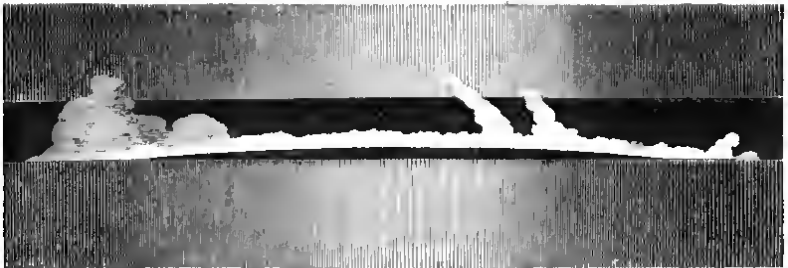


Fig. 2.